REMARKS/ARGUMENTS

As an inventor filing Pro Se, I requested an interview, and assistance in the final writing of a claim, from the examiner over the phone on May 7, 2004 following the examiner's review of this response. Additionally, I am respectfully providing the following clarifications for inclusion in the file wrapper for my case:

First, I would like to address the examiner's comment that "It's unclear how the system operates....It seems like the shape change of the strip 31 would create a force perpendicular to the guide rod means" on page 2 of the office action.

On page 3 of my application, I stated that the thermal focusing means 48 or 50 are located to one side or the other of the bearing means 33. The effect of said placement is that the force that the strip 31 creates is NOT perpendicular to the guide rod 32 – it is parallel - just as the crest of a wave moves in a plane parallel to the surface of the ocean. As heat is applied to strip 31, said strip 31 deforms toward the point of thermal application, forcing bearing 33 – free to move within housing 35 - to cause housing 35 to move away from the "bulge" on the strip 31, and subsequently to travel in a plane parallel to strip 31 along guide rod means 32. Similarly, a surfer on a surfboard is pushed along in a plane parallel to the surface of the ocean as he rides the crest of the wave, so does bearing 33 in housing 35 travel in a plane parallel to strip 31 along guide rod means 32 in response to the "wave" created on strip 31 by the application of a temperature differential to said strip 31 by focusing means 48 or 50 (in the opposite direction). As a "wave" cools, and another hot "wave" is generated on the strip 31, on the opposite side of the bearing 33, the force pushes said bearing 33 back toward the opposite thermal focusing means.

I have built numerous prototypes of the devices I disclose in my patent application, and they work exactly as described. Additionally, they are inherently capable of providing significant amounts of power – arguably much more than either the Abbott of Hobart patents which the examiner included as references in the office action.

Although certain mechanical elements which I refer to in my original patent application are similar to several elements referred to in Abbott's and Horton's claims, when viewed in the context of the physical configuration as described in both my specifications and drawings, there are clear differences in the way the devices are configured, and the way the components are used - and therefore, the novelty and uniqueness which they provide. In the interest of total clarification, I will now address the differences between each referenced component and apparatus in turn.

REMARKS/ARGUMENTS continued:

Horton's machine is significantly different in design and execution from the device which I disclose. In Horton's machine, the bearings are not in direct contact with the expand/contract members, and are therefore not equivalent in usage, or novelty, to mine. Horton's device depends on expansion and contraction of opposing elements of similar material – each having similar tensile strengths. As his machine is subjected to a temperature differential, the affected expansion members are expected to exert a force to pull the wheels toward each other and that action in turn causes the wheels to rotate on bearings about a fixed axis. However, it should be noted that in Hobart's device, similar elements which are in a state of contraction are mounted directly opposite said expansion members. The resulting opposing forces would likely nullify each other and the machine would move with almost no discernable level of torque.

My device provides a unique improvement over Hobart in that it places a slidable bearing in direct contact with a force generating member – strip 31 - so that the torque available to be created is directly related to the chosen thickness of the strip 31, its tensile strength, recovery characteristics, and width. Since there is a 4 to 1 ratio of austenite to martensite reset forces inherent in shape memory alloys, and I suggest the use of said alloys, the available power from my machine is available at approximately 75% efficiency – less the loss factors associated with bearings, and the application of the thermal differential. These efficiencies are a significant advance over the prior art.

Abbott's Thermally Reactive Material 7 is disclosed as one or more linear elements held under tension between two points through radial mounting between the center of his device and the perimeter. The Thermally Reactive Perimeter Wheel Strip 31 in my device is mounted substantially parallel to the guide rod 32 along which bearing 33 in housing 35 may traverse. Abbott's "sheaves 18" are indicated as part of a scheme to elongate his Thermally Reactive Material wire length. The application in art is substantially different from my "bearing means 33" which may be simply any "low friction element" used as a "kick-away point" on the Thermally Reactive Perimeter Wheel Strip 31 in my invention.

A dramatic difference between the invention disclosed in my patent application, and the Abbott reference cited by the examiner, is that the Abbott patent discloses <u>longitudinal</u> thermally reactive elements that are oriented substantially perpendicular to the rotation of the output shaft of their devices, requiring any induced motive force to go through a direction change – thereby reducing efficiency. In my invention, motive force is applied in a substantially parallel position relative to the direction of movement of the driven element. This approach has the effect of allowing a tremendous increase in efficiency, as well as the simplification of the mechanism, and reduction of moving parts.

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REMARKS/ARGUMENTS continued:

Additionally, in the Abbott patent, the thermally reactive elements are comprised of a length of thin memory metal bound between the perimeter of the mechanism and a point substantially adjacent to a central bearing means, about which the work element rotates. The Abbott invention exerts a pull from the external perimeter of his device between, and to, the internal perimeter of the device. This is a highly inefficient mechanism due to the inherent fulcrum proximity to the point of rotation. In my invention, the available torque, and hence the available work, is increased by several orders of magnitude due to the opportunity to place the work fulcrum at any distance from the point of initial motion, and the fact that there is no efficiency loss due to the conversion of perpendicular force to rotary motion that is inherent in Abbott's design.

Both Hobart's, and Abbott's inventions, are limited in force generation and effectiveness in that they use the stretching and shrinking of lengths of thermally reactive material, bound between fixed points on moveable elements, to perform work through a substantially linear extension of the thermally reactive material. My inventions use an element that pushes away from the surface of the thermally reactive material to extract work – thereby using the tensile strength of a potentially large surface area of the thermally reactive material as the primary limiting force factor. In my invention, if a large amount of motive force were desired, the thickness and width of the strip 31 could simply be increased. The potential work output of my devices may be configured to be many orders of magnitude greater than either Hobart's or Abbott's machines.

Applicant respectfully requests that a timely Notice of Allowance be issued in this case.

Respectfully submitted,

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